Stranding of Marine Megafauna in Indonesian Waters: Causes of the Phenomenon and Handling Methods (Seastar2000)

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Stranding of Marine Megafauna in Indonesian Waters: Causes of the Phenomenon and Handling Methods (Seastar2000)

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ABSTRACT
The stranding of marine megafauna such as whales, whale sharks or megamouth shark is a phenomenon that happens almost every year in Indonesian waters. There were 17 events of stranding whales and three events of stranding whale sharks recorded from all over the country during 2012-2013. Several factors were suggested as the causes of this phenomenon. Illness and disease problems seem to be a main factor for stranded whales, while human activities and plentiful food availability in the coastal areas became main factors for stranded whale sharks. A standard of procedure for handling stranded marine animals has been developed in Indonesia. Several limitations may generate on-going obstacles for these handling efforts, and pose challenges to the government and all stakeholders involved.

KEYWORDS: Stranding, cetacean, whale shark

INTRODUCTION

Indonesian waters are known as an important Southeast Asia refuge and migration route for a number of large marine animals such as dolphins, whales and whale sharks. These animals are found throughout the archipelago, from the Indian Ocean to the western Pacific, but the deep eastern waters are an important pathway for migration (Tomascik et al., 1997). At least 30 species of cetaceans, one sirenian (the dugong) and two species of large sharks (whale shark and megamouth shark) occur in Indonesian waters (White et al. 2004; Mustika, 2006; White & Cavanagh, 2007). Species considered to be Indonesian marine megafauna include the whale groups such as the blue whale (*Balaenoptera musculus*), the sei whale (*B. borealis*), the fin whale (*B. physalus*), Bryde's whale (*B. brydei*), the minke whale (*B. acutorostrata*), the humpback whale (*Megaptera novangliae*), the sperm whale (*Physeter macrocephalus*) and the killer whale (*Orcinus orca*), and also the shark group, such as the whale shark (*Rhincodon typus*) and the megamouth shark (*Megachasma pelagios*). The blue whale is known to be the largest animal on earth, while the whale shark is confirmed as the largest fish. The blue whale can attain a length of up to 30 m (about 98ft), while the largest estimated individual whale shark had a length of 20 m (Calambokidis, 1998; Norman, 2005).

Marine megafauna stranding events happen occasionally almost every year, but only a few are reported. The majority of cetaceans stranded are tooted whales and occasionally ballen whales. A single stranding occurres more frequently for large animals, while a mass stranding is more common for smaller marine mammals such as pilot whales and false killer whales (Isaacs and Dalton, 1992). Marine mammal stranding events in Indonesia have been recorded better than those for whale sharks. Stranding data has been collected and compiled since 1987 by Marine Mammals Indonesia, a mailing list group containing several individual who are concerned and interested in the conservation and research of marine mammals in Indonesia (Mustika et al., 2009). The data are commonly recorded from electronic and printed media (TV, radio and newspaper), and also personal observations. The highest record of stranding events occurred in 2010, with 18 cases, and the most common stranded cetacean was the sperm whale. In a period of 1987 to 2007, 42.86% of standing cases involved unidentified cataceans. This shows that the little attention is given to stranding events. Furthermore, the lack of knowledge about cetaceans was a major obstacle (Mustika et al., 2009). On the other hand, the stranding events of large sharks were usually reported by the media, but only a few were officially recorded. There is still no organization or citizen's group concerned with the stranding cases of those animals. Different from cetaceans, large sharks (especially for the whale shark) have high economical value, especially for the fins, and the meat can be utilized for consumption as well. Moreover, all sharks are already dead when they stranded, and most of them are utilized by local people. The only case of a stranded shark being well-recorded and treated was a juvenile megamouth shark that washed ashore at Gapang Beach, Aceh in 2004 (White et al., 2004). The specimen was collected and stored in the Research Centre for Oceanography in Jakarta.

At least twenty stranding cases occurred in Indonesia during 2012 until early 2013, with 17 cases of whale standing and three cases of whale sharks (Table 1, Figure 1). Stranding involving a single individual is the most common type of stranding event in Indonesia, as opposed to mass stranding. Mass stranding only occurred in Nusa Tenggara Timur in October 2012, involving 51 short-finned pilot whales; 47 individuals were found dead and only four of them were alive and released. Most stranding cases ended in the death of the animals. A living stranded sperm whale was found at Karawang, Jawa Barat in July 2012 and it was successfully released within two days. However, it was found dead four days later at a different location, due to its injuries and weakened condition. On the other hand, three stranded whale sharks that were recorded in the period of 2012-2013 were originally found alive, but many factors related to their handling and treatment caused their death within several hours time.

Since the sperm whale stranding event in July 2012, information about the causes of stranding and how to handle the animals is urgently needed. This paper reviews some of the causal factors, community responses and handling guidelines developed by the Indonesian government.

Table 1. Cases of stranded giant marine animals in Indonesia in 2012 and early 2013

No	Date	Species	English name	Location	Size in m (max)
Marine Mammals*					
1	10 February 2012	*Physeter macrocephalus*	Sperm whale	Simeleu, Aceh	15
2	13 June 2012	*Mesoplodon densirostris*	Blainville's Whale	Tapanuli, Sumatera Utara	5
3	26 July 2012	*Physeter macrocephalus*	Sperm whale	Karawang, Jawa Barat	12
4	30 July 2012	*Physeter macrocephalus*	Sperm whale	Bekasi, Jawa Barat	12
5	6 September 2012	*Globicephala macrorhynchus*	Short-finned pilot whale	Cianjur, Jawa Barat	10
6	9 September 2012	*Globicephala macrorhynchus*	Short-finned pilot whale	Panciran, Jawa Timur	4
7	11 September 2012	Unidentified Species	Unidentified Species	Tanjung Jabung, Jambi	13
8	19 September 2012	Unidentified Species	Unidentified Species	Garut, Jawa Barat	15
9	25 September 2012	*Physeter macrocephalus*	Sperm whale	Bima, Nusa Tenggara Barat	5
10	1 October 2012	*Globicephala macrorhynchus*	Short-finned pilot whale	Sabu, Nusa Tenggara Timur	9
11	2 October 2012	*Physeter macrocephalus*	Sperm whale	Cidaun, Jawa Barat	12
12	25 October 2012	*Physeter macrocephalus*	Sperm whale	Cilacap, Jawa Tengah	10
13	27 October 2012	*Megaptera novaeangliae*	Humpback whale	Cilacap, Jawa Tengah	unknown
14	17 November 2012	*Balaenoptera* sp.	Baleen whale (other than humpback)	Ujung Kulon, Banten	8
15	25 December 2012	*Balaenoptera* sp.	Baleen whale (other than humpback)	Sampang, Jawa Timur	8
16	2013 - March 5	*Feresa attenuata*	Pygmy killer whale	Sanur, Bali	unknown
17	2013 - February 19	*Kogia sima*	Dwarf sperm whale	Sanur, Bali	2
Sharks					
1	1 August 2012	*Rhincodon typus*	Whale Shark	Bantul, Yogyakarta	13
2	3 August 2012	*Rhincodon typus*	Whale Shark	Bantul, Yogyakarta	9
3	20 April 2013	*Rhincodon typus*	Whale Shark	Karawang, Jawa Barat	5

* Source: http://www.whalestrandingindonesia.com

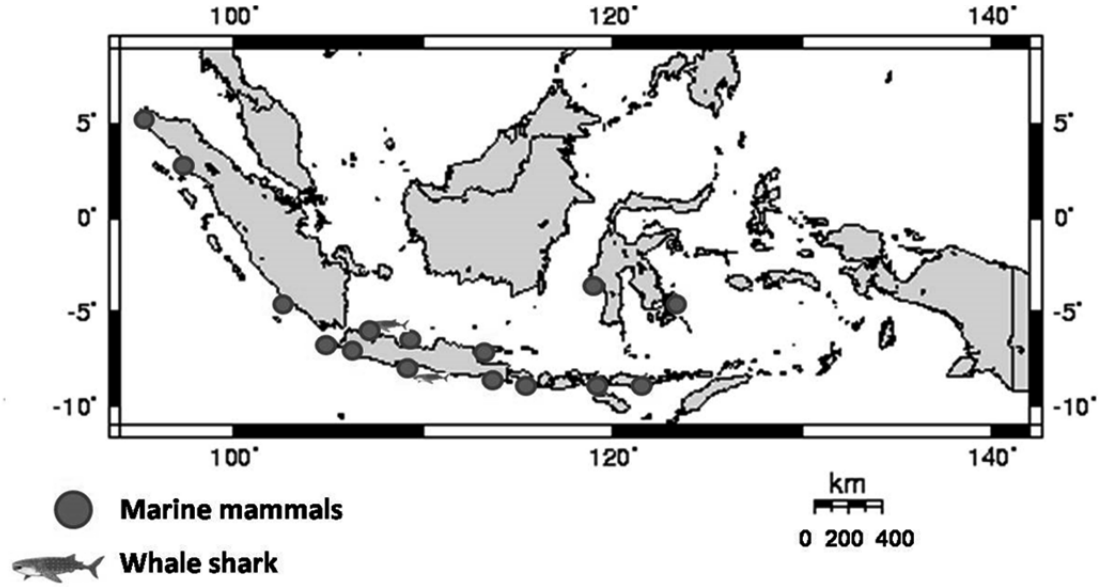

Figure 1. Stranding locations of marine mammals and whale sharks in 2012 and early 2013

THE CAUSES OF STRANDING

There are several factors causing stranding of marine animals; the most important internal factors being illness, malnutrition, natural toxins and infectious diseases. The reduction in food intake due to prey shortage may cause weight deficit, blubber thickness reduction, malnutrition and illness, while some toxic substances such as heavy metals and polychlorinated biphenyls are known to stimulate immunosuppression which can result in secondary viral diseases (Morimitsu et al., 1987; Jauniaux et al, 1997). Poisoning by harmful algal blooms and physical injuries due to predation or natural injury can also lead to illness and weakness of some marine animals. Injuries also can be caused by humans, as some may be hit by boats or entangled or hooked in fishing gear. The ill or wounded cetaceans commonly head to the beach in a "suicide mission"; this event is deemed to be a natural phenomenon by some authors (Hall et al., 1971; Stroud and Roffe, 1979; Kraus, 1990; Martin, 1991).

Other external factors causing stranding are errors in nautical navigation and depth assessments. Some cetaceans, and also whale sharks, sometimes chase their prey inshore and then get trapped in the shallow waters (Evans et al., 2005). Complex topography (i.e. funnel shaped topography, narrow and steeply-sloping beach), heavy waves and low tides usually serve as barriers that keep slow-swimming mega fauna from coming back into deeper waters once they get trapped (Rice, 1989; Needham, 1993; Beckley et al., 1997). Disturbance of echolocation capabilities such as noise pollution and sonar disturbance, may lead the animal to misdirection and enter shallow waters as well (Evans, 1993). There is evidence of active sonar in the stranding events involving some cetacean species. Seventeen cetaceans were reported stranded in the Bahamas in 2000 after a United States Navy sonar exercise. Similarly, a number of mass strandings of beaked whales occurred in the Canary Islands each time the Spanish Navy conducted sonar exercises over the past decade. This continued until the Spanish government banned the military exercise in the area in 2004 (US Navy, 2001; Jepson et al., 2003; Fernández et al., 2013).

There are a few differences factors causing stranding between whales and whale sharks. Illness and infectious diseases have been suggested as the most importat causal factors, followed by pollution (including chemical, noise and solid wastes), unusual climatic events (such as tsunamis and earthquakes) and human activities (including boating accident, uncontroled ecotourism and fishing activities). Human activities such as fishing (both direct and bycatch), boating accidents and uncontroled ecotourism, were the most important causal factors for whale shark stranding, followed by food availability in the coastal area (which is related to the increase of primary productivity at certain seasons), illness and pollution (chemical and solid wastes). Most cases of stranded whale sharks in Indonesia between 2012-2013 were initially reported as animals 'washed ashore' near the beach, but not beached. The condition of the animals was also reported as 'still alive' but very weak and unable to swim to the sea. Local people then dragged them to the beach, causing the death of the animals. Different from marine mammals, whale sharks will die once they are out of water, making rescue of the animal impossible. This lack of understanding of animal biology among some local people, together with the desire to utilize the animal, are common obstacles to the successful rescue of stranded whale sharks.

COMMUNITY RESPONSES TO STRANDING MARINE ANIMALS

Concern on stranding phenomenon of marine megafauna in Indonesia, especially on marine mammals, has been shown by a group of people namely Marine Mammal Indonesia, which is interested on conservation and research on marine mammals. This group has collected cetacean stranding data since 1987 (Mustika et al., 2009) and up to present has recorded 116 stranding cases from all over Indonesia. Since 2012, the Indonesian government through the Ministry of Marine Affairs and Fisheries (MMAF) has facilitated a national stranding network by forming Indonesia Marine Mammal Rescue. This organization was formed to gather information on marine mammal stranding events in Indonesia, developing standard operational procedures (SOP) for stranding rescue, developing marine mammal database, raising community awareness and coordinating rescue mission for stranding animals. The MMAF then will allocate some tactical funds for rescue missions from national budget, besides other supporting funding from conservation agencies.

The community awareness for stranding whale shark is relatively less than for marine mammals. In a year, the stranding case for this animal is less frequent than for cetaceans. The rescue for stranding whale sharks is usually late due to the animals will die in a very short time once they beached. On the other hand, the number of people who concern on the conservation and research on whale shark is not as many as on cetaceans. In general, local people tend to utilize the whale shark once they found it washed on the beach. Rescuing the stranded body of whale shark is usually done locally. The rescue action by local conservation agency coordinating with local government is often done to prevent local people to utilize the animal. The dead animal is sometimes dragged back to the sea or buried on the beach, but some locals often take the fins off before the animal being discarded. The concern on whale sharks was begun when whale shark became international issue for its conservation. In relation to that, the MMAF launched a regulation in early 2013 (KepMen No.18 Th. 2013) to fully protect the whale shark in Indonesian waters. This species is prohibited to be caught both as target and bycatch, and its part or whole of the body is not allowed to be utilized for any reason except for research purpose. Therefore, the stranding whale shark is supposed to be rescued adopting method of the stranding marine mammals with some modifications.

HANDLING METHODS

The standard of operational procedure for stranding animal in Indonesia was developed by the Ministry of Marine Affairs and Fisheries and Indonesia Marine Mammal Rescue through Marine Animal Stranding Management. There are some steps of processes the stranding marine animal, from gathering information to rescue procedures (Figure 2). All information related to stranding case received by the MMAF is firstly subject to check its validity by contacting the local government or police station where the stranding reported. The team of Indonesia Marine Mammal Rescue is then visiting the stranding location and making evaluation related to the accessibility of the stranding animal. If the location is accessible, the team will check the condition of the animal and make coordination with local government and stakeholders to decide the next rescue procedures. For living animal, further physical examination will be performed to find out the ability of the animal to survive if it is released. The option to rehabilitate the animal is only possible to relatively small animals, but for the stranding marine megafauna, this is not become an option due the size of the animal that makes impossible to keep in a rehabilitation station (Figure 3). Moreover, Indonesia still does not have a good rehabilitation unit for large marine animals. On the other hand, if the animal is found dead, then the stranding location is not accessible, releasing the animal is still become an option if it can be accessed through the sea.

In-situ treatment may be a most possible option for stranding animal with weak physical condition. Avoiding stress situation of the animal is the most important step to keep the animal alive. A barrier should be made to prevent people other the rescuers to approach and disturb the animal. Also, the body which is exposed from the water should be kept in moisture condition. A complete procedure to rescue and treat the stranded animals especially for marine mammals is available in several publications (Wiley, et al., 2001; Geraci and Lounsbury, 2005; Whaley and Borkowski, 2009) and websites (www.nmfs.noaa.gov; www.oceanadventure.com.ph).

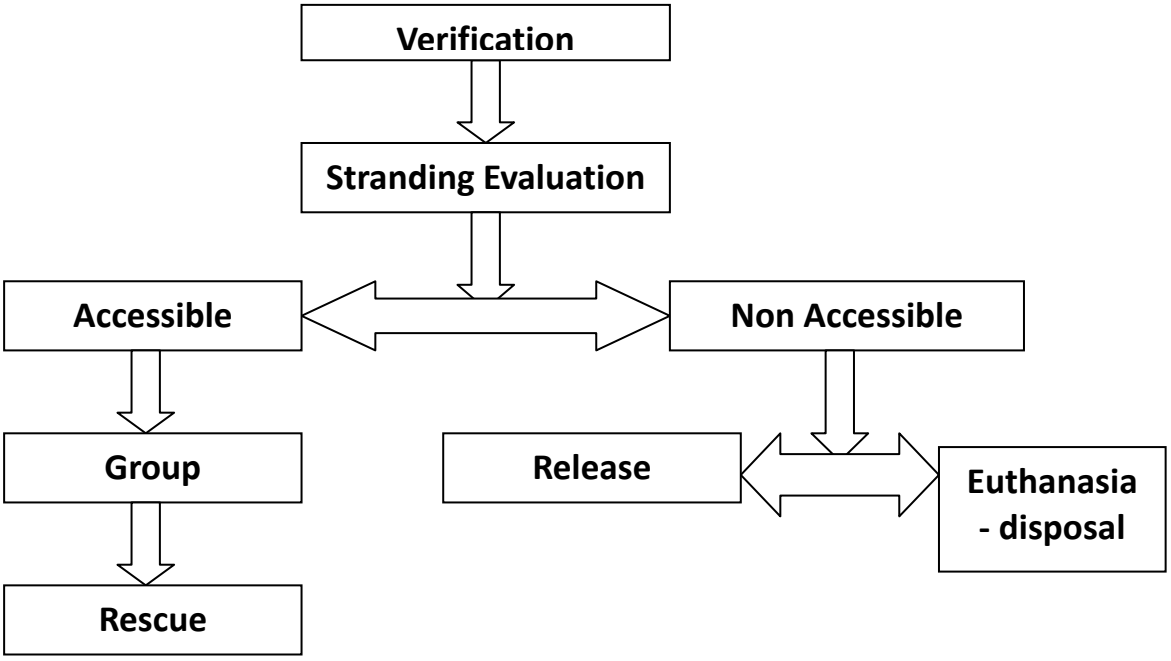

Figure 2. Flow chart of operational procedures related to stranding marine animal management in Indonesia

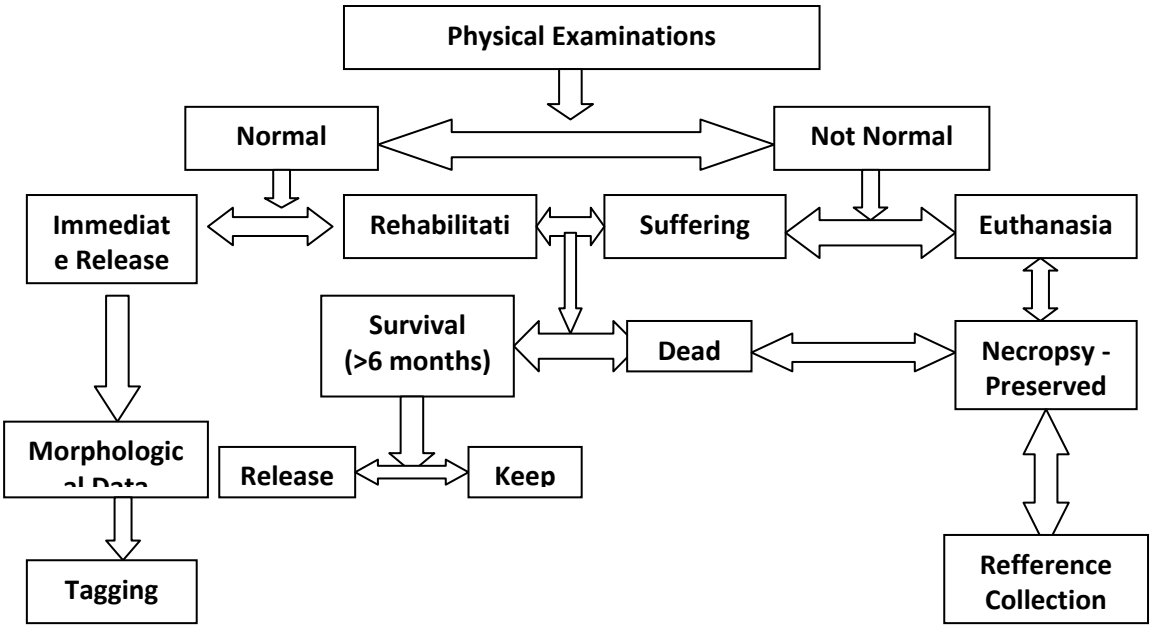

Figure 3. Flow chart of handling method for living stranding marine animal

Handling method for stranded whale shark, on the other hand, is a bit different from cetaceans, especially for handling living animals. Both stranded cetacean and whale shark should be kept in the water to avoid dehydration. In order to treat the cetacean, we must keep away the blow nose from water but for the whale shark, due to it is a fish, we have to put all parts of its body in the water or flowing some water on its mouth through the gills to keep the animal breathing. Rescuing the stranded whale shark and release it back to the sea, however, is much difficult due to the short of life time of the animal when stranding. Therefore, the fast respond and appropriate handlings for stranded whale shark are required.

There are several options to handle the dead stranding marine animal. If the size of the animal is still possible to transport, the carcass or the skeleton can be preserved for educational purpose. Preserving the animal can be done by injecting an amount of fixatives; buried in the sand or sunk in the sea and then excavate the skeletons after a period of time; and dried the animal (this option can be done only in an area where is far away from civilization). In contrast, if the stranded animal is suspected to carry some diseases that may harm to

human being or the environment, then the dead animal should be destroyed by burning it or being exploded. An example of a successful preservation by drying the animal was done by local people in Bantul, Yogyakarta. They preserved a stranded whale shark traditionally and made it as a tourist attraction (Figure 4).

Figure 4. A stranded whale shark being preserved by locals to be a local tourist attraction in Batul, Yogyakarta (left) and a sign board explaining about the animal (right)

There are some limitations causing the handling efforts of the stranding marine megafauna being not optimum. The limited of trained human resources especially in the remote area is the main obstacle for fast respond to rescue the stranded animal. Other factors that are also become limitations in the rescue action i.e. the restricted funding, especially from the government fund; uncoordinated stranding network across the country; the limited awareness of local people to report the stranding event, including the tendency to utilize the animal by locals; and high mortality rate of the stranded animal. Also, incomplete stranding database, such as information on exact coordinate, species name, length and sex of the animal, etc., and unknown causes of stranding, can slow down the rescue effort of some living animals.

Therefore, there are some challenges for the government (in this case, the MMAF) to coordinate all stakeholders, local government, and local communities (local leaders) to build a strong network, facilitating trainings for rescuing stranded animal, raising public awareness to report the stranding event, and gathering access to special government fund for rescue missions. On the other hand, scientific institutes and universities should be involved in developing research on marine megafauna and doing analyses of possible stranding cases, in order to enrich the knowledge on the stranding phenomenon of marine megafauna in Indonesia.

CONCLUSION

Stranding phenomenon of marine megafauna in Indonesia can be a medium for all parties to understand the behavior of marine megafauna relating to the characteristics of Indonesian waters and also the anthropogenic impacts on marine environment. Also, this phenomenon can be a lesson learns for people to be aware on their marine environment and concern on its sustainability.

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